



**National Recovery Technologies, Inc.**

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# Sorting of Postconsumer Plastics Resins

## DESCRIPTION OF THE TECHNOLOGY

With support from the Environmental Protection Agency's (EPA) Small Business Innovation Research (SBIR) Program, National Recovery Technologies, Inc. (NRT) has developed and commercialized an innovative process for sorting postconsumer plastic containers. NRT's process is capable of sorting plastics by polymer with high accuracy and at the high-speed throughputs required for cost-effective recycling. Plastics constitute about 9 percent by weight of municipal solid waste, and they occupy approximately one-fourth of the volume of the waste stream. The cost of transporting and disposing of plastics in landfills is very expensive due to their light weight and large volume. In addition, plastics in landfills are highly resistant to degradation. Therefore, EPA has recommended recycling as the preferred management method for plastics over alternative landfill or incineration methods.

For plastics recycling to be economically viable, the recycled resins must be of high quality and priced competitively with virgin resins. To produce high-quality recycled resins that can replace virgin resins, it is necessary that the recycled resins be cost-effectively sorted to high-purity specifications. In particular, it is necessary that the plastics be sorted by individual polymer while minimizing processing costs. NRT's sorting process satisfies these requirements by coupling high-speed spectroscopy for posi-

tive polymer identification, concurrent parallel processing for rapid identification, quick real-time sorting response, and precision air jet selection of materials. Because NRT's sorting process facilitates plastics recycling, it supports EPA's goal to reduce the quantity of waste requiring disposal.

Previously, some postconsumer packaging container resins were sorted automatically according to their visual color characteristics and visual light transmission properties, resulting in a pseudo-polymer sort. However, this is only an approximation and until the introduction of NRT's technology, it only was possible to sort plastics into a few major constituents and only at relatively low accuracy, requiring significant manual sorting for quality control. Another system using expensive x-ray technology currently is used to sort polyvinyl chloride (PVC) plastics from polyethylene terephthalate (PET) plastics; however, its accuracy is somewhat limited and is not applicable to other polymers.

## SIGNIFICANCE OF THE TECHNOLOGY

NRT's new technology overcomes the inaccuracies and limited applicability inherent in existing technologies by providing rapid positive identification of plastics by polymer type according to its infrared (IR) spectral fingerprint. Each polymer has a unique IR fingerprint and,

## SBIR Impact

- ✦ NRT has developed a highly accurate, high-speed process for sorting postconsumer plastics resins by polymer type.
- ✦ The new technology enables low-cost automated sorting of postconsumer plastics for recycling, which significantly improves the economics for plastics recycling.
- ✦ NRT's new technology is cost effective for low- and high-volume applications, making automated sorting of plastics affordable for community materials recovery facilities.
- ✦ Numerous commercial systems have been installed at recycling facilities in North America and Europe.
- ✦ Negotiations are in process for installation of additional units in the United States, Europe, and Japan.



**NRT's technology facilitates accurate, high-speed sorting of postconsumer resins by polymer type. It couples high-speed spectroscopy for accurate polymer identification with concurrent parallel processing for rapid identification to enable cost-effective sorting to high-purity specification.**

therefore, can be readily distinguished and sorted from other polymers.

Current automated systems are complicated and require a high level of technical sophistication to reconfigure system sorting characteristics. Consequently, it has been difficult for operators to control these systems to the level and precision necessary to optimize performance. NRT's technology eliminates this problem by introducing a user friendly man-machine interface that incorporates a touch screen graphical interface so operators can easily set system-sorting parameters and control system operation.

#### **COMMERCIALIZATION SUCCESS**

Numerous commercial systems have been installed in North American and European recycling facilities. NRT expects that this innovative sorting system will be applied in the recycling industry worldwide, both in new applications and in replacement of older generation automated sorting systems currently in use. In 1991, NRT introduced the award-winning VinylCycle® Separator, the world's

first system for sorting PVC bottles from PET bottles at industrial feed rates. Developed in cooperation with EPA and the Vinyl Institute, the VinylCycle® has become the industry standard for this critical sorting task and the "workhorse" system for most major PET plastics recyclers. NRT's VinylCycle® Separator is in commercial operation at various Fortune 500 companies, plastic processors, and waste companies in the United States and throughout the world.

#### **COMPANY HISTORY**

NRT, based in Nashville, TN, is a leader in the recycling equipment industry, providing equipment and systems for sorting municipal solid waste, curbside collected materials, and plastics waste streams. NRT proprietary technologies are on the cutting edge of automated sorting systems. NRT assists in the recovery of materials for alternate uses while preserving valuable landfill space. NRT systems recover aluminum, steel, glass, newspaper, corrugated box-board, mixed waste paper, plastics, and batteries.

## **What is the SBIR Program?**

EPA's Small Business Innovation Research (SBIR) Program was created to assist small businesses in transforming innovative ideas into commercial products. The SBIR Program has two phases—Phase I is the feasibility study to determine the validity of the proposed concept and Phase II is the development of the technology or product proven feasible in Phase I. EPA also offers Phase II Options to accelerate the commercialization of SBIR technologies and to complete EPA's Environmental Technology Verification (ETV) Program. For more information about EPA's SBIR Program and the National Center for Environmental Research, visit <http://www.epa.gov/ncer/sbir>.